

CLAIMS

5 1. A terahertz spectroscopy system comprising:
 a terahertz source for illuminating, in use, a sample with a pulse of radiation
 in the terahertz frequency range;
 excitation means for providing excitation energy in the form of a beam on a
 selected portion of the illuminated sample prior to or during illumination of the sample
10 by the terahertz source;
 a terahertz sensor for receiving energy from the illuminated sample; and
 processing means for receiving signals from the terahertz sensor and
 processing them to provide an output representative of the terahertz spectrum
 perceived by the sensor.

15 2. The system of claim 1, wherein the excitation means is a laser.

3. The system of claim 2, wherein the laser also provides the excitation for the
 terahertz source.

20 4. The system of claim 1, wherein the excitation means provides excitation
 energy in the form of a neutron beam.

5. The system of claim 1, wherein the excitation means provides an acoustic wave
25 beam.

6. The system of claims 1 to 5, wherein optical components are provided in the
 system in order to focus the terahertz radiation onto the sample and onto the terahertz
 sensor.

30 7. The system of any preceding claim, wherein means are provided for controlling
 the direction of the exciting energy to scan it across the surface of the sample in use.

35 8. The system of claim 7, wherein means are provided to control the illumination
 of the terahertz radiation in order to enable scanning of this across the sample.

9. The system of any preceding claim, wherein there is provided means for focussing or localising the excitation energy in order to control its spatial resolution and hence control the overall spatial resolution of the system.

5

10. The system of any preceding claim, wherein the terahertz sensor is an electro-optic sensor.

11. The system of claim 10, wherein the sensor is an EOS crystal.

10

12. The system of any of claims 1 to 7, wherein the terahertz sensor is a photoconductive sensor.

13. The system of any preceding claim, wherein the processing means is arranged 15 to control the Terahertz source and excitation means in order to control illumination of the sample.

14. The system of claim 13, wherein the processing means is arranged to control 20 illumination of the sample such that a reference measurement is taken without excitation energy on the sample and is also arranged to provide a differential signal based upon a comparison between the reference measurement and other measurements.

25

30

35